MONTHLY WEATHER REVIEW.

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INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during January, 1885, based upon the reports from the regular and voluntary observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic ocean during the month are also given, and their approximate paths shown on chart i.

The paths of eleven atmospheric depressions are traced on chart i. and are described under "Areas of low barometer;" the average number of depressions for the month of January during the last eleven years is 13.4.

The mean pressure for the month differs but slightly from the normal in all parts of the country except in New England and portions of the lake region and middle Atlantic states, where it was from .05 to .10 inch below the normal.

The month was decidedly colder than the average January from the Ohio valley and lower lakes westward to the eastern portions of Montana, Wyoming, and Colorado, and also in Texas, Idaho, and the eastern portions of Oregon and Washington Territory; it was slightly warmer than the average along the coasts of the Atlantic and Pacific..

The precipitation was in excess of the average in the districts east of the Mississippi river and from Missouri and Kansas southward to the Rio Grande river; it was deficient in the extreme northwest, upper Missouri valley, Rocky mountain districts and on the Pacific coast.

The severest snow-storms of the month occurred in the western and southern districts during the passage of low areas v. and x.; in consequence of these storms travel of all kinds was seriously interrupted and heavy losses of live-stock were sustained.

Tornadoes occurred on the 11th in Alabama and Mississippi, and on the 12th in Georgia, causing loss of life and the destruction of much property.

In the preparation of this REVIEW the following data, received up to February 20th, 1885, have been used, viz.: the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and twenty-nine Signal Service stations and seventeen Canadian stations, as telegraphed to this office; one hundred and fifty-three monthly journals and one hundred and sixty-one monthly means from the former, and seventeen monthly means from the latter; two hundred and eighty-one monthly registers from voluntary observers; forty-five monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime Register;" monthly reports from the New England Meteorological Society, and from the local weather services of Alabama, Georgia, Illinois, Indiana, Minnesota, Missouri, Nebraska, Ohio, and Tennessee, and of the Central Pacific Railway Company; trustworthy newspaper extracts; and special reports.

ATMOSPHERIC PRESSURE.

[*Expressed in inches and hundredths.*]

The distribution of mean atmospheric pressure for January, 1885, determined from the tri-daily telegraphic observations of the Signal Service, is shown by the isobarometric lines on chart ii.

The mean pressure for the month is greatest over the middle and northern plateau districts, where an area is inclosed by an isobar for 30.25; it is least over the Canadian Maritime Provinces, where the barometric means fall to 29.88 and 29.89 respectively, at Sidney, Nova Scotia, and Father Point, Quebec. The region inclosed by the isobar for 30.2 embraces the greater part of the United States and extends from the eastern portions of Washington Territory and Oregon southeastward to the Gulf and Atlantic coasts. Along the immediate coasts of Washington Territory and Oregon, and in southern California, the mean pressure decreases to 30.1. An isobar for 30.15 is traced from northern Minnesota to the Virginia coast; to the north and east of this line the barometric means decrease to 29.9 and below, as stated above.

The mean pressure, as compared with that for December, 1884, shows a decrease over the northern portions of the country from central Montana to the Atlantic coast, the deficiences being greatest in New England and the Maritime Provinces, where they vary from 07. to .15. In all other districts the barometric means are higher than those for December. The increase ranges from .10 to .15 from the lower Mississippi river to the south Pacific coast; from .08 to .18, in northern plateau and north Pacific coast region, and from .20 to .25 in the middle plateau and middle Pacific coast.

The departures from the normal pressure are given in the table of miscellaneous meteorological data; they are also exhibited on chart iv. by lines connecting stations of equal departure. Along the northern boundary of the country from Idaho eastward to the Atlantic coast, and in the upper Ohio valley and middle Atlantic states, the mean pressure is below the normal, the departures being less than .05, except in northern Michigan and in New England, where they vary from .05 to .10; a deficiency of .02 is shown at Cedar Keys, Florida. In all other districts the pressure is above the normal, but the departures are nowhere marked, being less than .05 at all stations, except .07 at Brownsville, Texas, and .05 at Fort Concho, Texas, and Fort Apache, Arizona.

BAROMETRIC RANGES.

The monthly barometric ranges at Signal Service stations are given in the table of miscellaneous data; they were greatest from the upper Mississippi valley to the New England coast, where they varied from 1.40 to 1.74, the greatest being reported from Eastport, Maine; they were least in Florida, California, and in the middle and southern plateau regions, where they varied from .52 to .60, except at Key West, Florida, where the monthly range was .36.

AREAS OF HIGH BAROMETER.

I.—The description of this area is a continuation of number v. of December, 1884. The morning report of January 1st showed the barometer to be highest in Manitoba, with a decided increase in the pressure extending over the lake region and thence south to the Gulf. On the morning of the 2d the centre of high pressure was in the Mississippi valley, and during the following twenty-four hours moved to the middle Atlantic coast, and on the morning of the 5th passed over Nova Scotia. On the morning of the 1st the cold wave had extended east and south, causing a fall in temperature of 26° to 37° in the lower lake region, 20° to 40° in Tennessee and the Ohio valley, and 17° to 26° in the Gulf states. During the day it reached the Atlantic coast, causing a fall in temperature of 20° to 30°. The time that elapsed from its first appearance in Montana until it reached the different districts is as follows: Missouri valley, eight to sixteen hours; Mississippi valley, seventy-two hours, having been, as stated in the description given of number v. in the REVIEW of December, 1884, retarded by the development of a low in this district; upper lake region, seventy-two hours; lower lake region, and Tennessee and Ohio valley, eighty hours; Atlantic coast, one hundred and four hours.

II.—This area first appeared on the California coast on the 4th. On the 5th a decided rise occurred in the extreme northwest; on the 6th a decided rise in the upper Mississippi and Missouri valleys and thence south to the Gulf. During the 7th the increase in pressure extended northeast to the lake region, and on the 8th over Nova Scotia. The movement of the centre of high pressure was east and south of California until on the morning of the 8th; the barometer was highest in Florida. Owing to this southerly movement no very decided fall in temperature occurred, the greatest being from 10° to 16° in the middle Atlantic states on the 7th.

III.—This area first appeared in Oregon on the 8th; the centre moved southeasterly into Kansas on the 9th, and reached the Atlantic coast on the 10th. The greatest changes in pressure occurred along a line from Oregon to Manitoba, thence across the great lakes up the Saint Lawrence valley, the changes in twenty-four hours being from .50 to .80. The accompanying cold wave first appeared on the afternoon of the 8th in Montana, the temperature having fallen 17° to 20° in twenty-four hours. The number of hours from this date until it was first felt in the other districts is as follows: Missouri valley, sixteen hours; Mississippi valley and upper lake region, twenty-four hours; lower lake region and Tennessee and Ohio valley, thirty-two hours; New England, forty hours; middle and south Atlantic and Gulf states, forty-eight hours. The minimum temperature occurred in New England during the night of the 10th and in the other districts, east of the Mississippi river during the night of the 9th. The general effect was a fall of 7° to 10° in southern districts, and from 15° to 20° in northern districts.

IV.—This area was central north of Montana on the morning of the 11th, where it remained, increasing in pressure, during that day. It moved into the Missouri valley on the 12th, and passed off the Atlantic coast on the 14th. The morning report of the 11th showed a fall in temperature of 20° to 30° in Montana and the Northwest Territories, and from 8° to 13° in the northern half of the Missouri valley. The number of hours from this date until the cold wave reached the other districts, and the fall in temperature, were as follows: upper Mississippi valley, sixteen hours, fall in temperature, 27° to 50°, the minimum occurring on the morning of the 13th; upper lake region, twenty-four hours, fall in temperature, 30° to 40°, the minimum on the morning of the 13th; lower lake region, thirty-two hours, fall in temperature, 20° to 30°, the minimum on the morning of the 13th; Tennessee and Ohio valley, and Gulf states, twenty-four to thirty-two hours, with a fall of 10° to 15° in southern portions, and 20° to 30° in the Ohio valley, the minimum generally occurring on the morning of the 13th; districts on the Atlantic coast, forty hours, with a fall in New England and the middle Atlantic states of 20° to 30°, and in the south Atlantic states of 10° to 18°, the minimum occurring on the morning of the 14th.

V.—This high area appeared in Montana on the 13th, where it remained highest during the 13th and 14th. The increase in pressure extended southward to the Gulf during the 15th and 16th, and thence northeastward to the Atlantic coast districts on the 17th and 18th. The cold wave appeared over the northern plateau on the afternoon of the 13th. On the 14th the temperature in the Missouri valley fell from 10° to 16°, the minimum occurring on the morning of the 17th, with a total fall in temperature of 10° to 15°. In the Mississippi valley and the west Gulf states the minimum occurred on the morning of the 17th, with a fall of 20° to 30° in forty-eight hours. The minimum occurred on the morning of the 17th over the west portion of the Ohio valley and Tennessee and the east Gulf states, and on the morning of the 18th over the eastern portion of these districts. The minimum occurred in the middle and south Atlantic states on the morning of the 18th, and in New England on the morning of the 20th. The fall in temperature was from 20° to 45°, the greatest fall being on the middle Atlantic coast.

VI.—The afternoon report of the 20th showed an area of high barometer central just north of Dakota. In Manitoba and northern Minnesota the barometer had risen from .39 to .47 inch, and the temperature had fallen from 17° to 21°. The centre of high pressure moved into the Mississippi valley on the 21st, and reached the Atlantic coast on the 22d; the increase in pressure ranged from .40 to .70. The minimum temperature occurred in the Missouri valley on the morning of the 21st and in the Mississippi valley and all districts to the east of it on the morning of the 22d. The fall in temperature during the passage of this area of high barometer was from 10° to 20°.

VII.—During the 23d the barometer rose from .20 to .40 inch over Montana and at stations in the Northwest Territories, the highest pressure being in the Saskatchewan valley. During the 24th the increased pressure extended eastward to the lakes and southward to the Gulf, and reached the Atlantic coast on the 26th, and continued in New England on the 27th. The cold wave accompanying the high barometer appeared in the Saskatchewan valley on the morning of the 23d, the temperature having fallen from 12° to 20°. By the morning of the 24th a further fall of 18° to 20° had occurred. Counting from this date (morning of the 24th) the number of hours that elapsed before it reached the different districts and total fall in temperature are as follows: Missouri valley, eight hours, fall in temperature, 20° to 30°; Mississippi valley, sixteen hours, fall in temperature 20° to 30°, the minimum occurring on the morning of the 26th; lake region, twenty-four hours, fall in temperature, 20° to 30°, the minimum generally occurring on the morning of the 27th; Atlantic coast, forty-eight hours, fall in temperature, 15° to 25°, minimum on the morning of the 27th; Tennessee and Ohio valley and east Gulf states, forty hours, fall in temperature, 18° to 28°, the minimum occurred on the morning of the 26th.

VIII.—The morning report of the 27th showed an area of high barometer central in Dakota. During the day it moved into the Missouri valley, and, on the 28th, into the east Gulf states. On the 29th the barometer was highest on the south and middle Atlantic coasts, and, during the 30th and 31st, the high area moved off to the northeast over Nova Scotia. The morning observations of the 27th, showed a fall in temperature of 17° to 24° in Minnesota, and 15° in the extreme northern portion of the Missouri valley. The number of hours that elapsed before the cold wave reached the other districts and its effect were as follows: Missouri valley, eight hours, fall in temperature, 15° to 20° (the minimum occurred in northern portions on the morning of the 27th, and in southern portions on the morning of the 28th); Tennessee and Ohio valley, six;

teen to twenty-four hours, fall in temperature from 20° to 30°, the minimum occurring on the morning of the 28th; Gulf states, twenty-four to thirty-two hours, fall in temperature, 10° to 20°; the minimum generally occurred on the morning of the 28th; Atlantic coast, forty hours, fall in temperature, 20° to 30°, the minimum occurring on the morning of the 28th, except in the eastern portion of the east Gulf states, where the minimum occurred on the morning of the 29th.

AREAS OF LOW BAROMETER.

On chart i. are traced the paths of the centres of eleven areas of low barometer, which are herein described.

The following table shows the latitude and longitude in which the centre of each area was first and last located, and the average hourly movement.

Areas of low barometer.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long W.	
	° ′	° ′	° ′	° ′	
No. I	52 00	113 00	50 00	86 00	26.0
II	27 00	97 00	50 00	64 00	30.9
III	52 30	111 00	49 30	62 30	32.8
IV	53 00	110 30	49 30	61 00	57.6
V	31 30	94 00	45 00	67 30	33.9
VI	51 30	95 00	49 00	59 00	33.5
VII	51 00	112 30	50 30	90 00	28.0
VIII	39 00	102 30	50 30	66 00	42.7
IX	47 00	82 00	50 30	62 30	39.6
X	42 30	100 30	45 00	61 30	43.7
XI	49 30	105 00	45 30	84 00	46.7
Mean hourly velocity					37.8

I.—This area first appeared in the Saskatchewan valley on the afternoon of the 3d. Its course was generally southeasterly, passing just north of Lake Superior. It caused in the lake region cloudy weather during the day, and light snows during the night of the 3d, which continued in the upper lake region on the 4th. Maximum velocities of twenty-six miles at Milwaukee, Wisconsin; thirty-six miles at Grand Haven, Michigan, and thirty-two miles at Buffalo, New York, were reported on the 4th. During the 3d and 4th, the winds in the upper Mississippi and Missouri valleys, and the lake region, were from the south.

The observer at Fort Assinaboine, Montana, reports the following: "a high southwesterly wind set in at 5. a. m. on the 3d: it soon afterwards increased to the force of a gale which continued until late in the evening. The wind movement for the sixteen hours ending at 8.41 p. m., was five hundred and fifty-nine miles, or an average of thirty-five miles per hour, the maximum being fifty-three miles."

II.—This low area first appeared on the Texas coast near Brownsville. The afternoon report of the 3d indicated its approach, and by midnight the wind had attained a velocity of twenty-nine miles per hour at Indianola, Texas. The centre was near Brownsville on the afternoon of the 4th and passed rapidly to the north, moving over the lake region on the 6th. Rain began in Texas on the 3d; it also occurred on the same day in the south Atlantic and Gulf states. On the 3d and 4th there was a decided fall in the barometer in all districts east of the Rocky mountains, caused by the movement of low area i. from the northwest and low area ii. from the southwest. Rain continued to fall in the west Gulf states during the 4th and 5th, and fell the in south Atlantic and east Gulf states on the 3d, 4th, 5th, and 6th, the weather clearing during the night of the 6th. Rains occurred on the 5th and 6th in all districts east of the Rocky mountains and north of Tennessee. The following wind velocities were reported during the passage of this storm: Galveston, Texas, twenty-six miles, and Indianola, Texas, forty miles on the 4th. In the lake region and on the Atlantic coast, north of Hatteras, from twenty-six to forty-four miles on the 6th, and high northwest winds on the Atlantic coast on the 7th.

The following notes are from the reports of the Signal Service observers:

Indianola, Texas, 4th: during the early morning a high easterly wind prevailed. Vessels arriving at this port reported having experienced rough weather on the Gulf.

Jacksonville, Florida, 6th: during the afternoon the wind became variable in direction, and blew in violent squalls, causing considerable damage in this vicinity; the schooner "Warren Potter" broke from her moorings.

Buffalo, New York: a storm from the southwest began at 12.55 a. m. of the 7th and continued until 12.15 p. m.; it was most severe at 4 a. m., when a wind velocity of forty-nine miles was recorded.

Rochester, New York: high winds prevailed on the 6th and 7th; a velocity of thirty-four miles occurring on the latter date.

Barnegat City, New Jersey: the bark "Aberdeen" went ashore six miles south of this station at 6.15 a. m. on the 6th; a high wind and heavy sea prevailed at this station.

III.—This area appeared in the Northwest Territories on the morning of the 7th, passed north of the lake region on the 8th, reaching the Saint Lawrence valley on the 9th, and disappeared over the Gulf on the 10th. Its effect was slight, causing only light snows in portions of the lake region and New England. The highest winds were from the northwest after the storm-centre had passed. Maximum velocities of twenty-five to thirty-nine miles were reported in the lake region, and from twenty-five to forty-eight miles on the Atlantic coast. In advance of the storm-centre the temperature generally rose about 10°.

The observer at Oswego, New York, reports the following: "high winds prevailed from 6.35 p. m. of the 9th until 4.15 p. m. on the 10th; the storm reached its greatest force, thirty-nine miles per hour, at 6.57 a. m. on the 10th. Some buildings in this city were damaged."

No. IV.—This low area first appeared in the same locality as did low areas i. and iii. Starting in the northwest at midnight of the 9th, the centre was near Lake Superior at midnight of the 10th, but an area of comparatively low barometer extended from this centre southwesterly as far as Kansas. The barometer changes in the following eight hours were such as to change the locality of lowest pressure from the northeast to the southwest end of the trough of low pressure, and the centre of the storm on the morning of the 11th was in Kansas and completely surrounded by the isobar of 29.50. From this point it moved to the northeast, the pressure at the centre decreasing to 29.30 as it passed over the lakes, and to 29.00 in the Maritime Provinces. Precipitation occurred in the Mississippi valley and all districts to the east of it on the 11th, generally as rain, but, in the northern districts, turning into snow. Cloudy weather, with rain or snow, continued in the lake region and in the districts on the Atlantic coast on the 12th. Maximum velocities of twenty-eight miles on the Texas coast, forty miles in the lake region, and twenty-five to forty-seven miles on the Atlantic coast, were reported. A warm wave, represented by a rise in temperature of 10° to 30° preceded the centre.

The Signal Service observers report the following:

Fort Macon, North Carolina: high winds prevailed during the night of the 11–12th, and continued until 2.45 p. m.; from 9.10 to 9.25 a. m., a wind velocity of seventy miles was recorded, the anemometer showing a velocity of eighty-three miles for five minutes. The coast telegraph line was blown down, and some small boats in Beaufort harbor were damaged.

Fort Myer, Virginia, 12th: high winds prevailed during the greater part of the day, at times blowing at the rate of forty miles per hour.

Rochester, New York, 12th: high winds prevailed from 4 a. m. until the early morning of the 13th; a velocity of forty miles per hour occurred at 12.35 p. m. on the 12th.

Boston, Massachusetts, 12th: a severe westerly storm prevailed during the day, the wind reaching a velocity of forty-two miles, south, at 8.45 a. m. The storm caused much damage along the coast and in this city also. At Plymouth a church steeple was blown over and carried a distance of one hundred yards.

Portland, Maine, 12th: a high southeasterly wind began at 5.45 a. m., reaching a velocity of forty miles at 9.40, and ending 1.15 p. m. A number of telephone wires were blown down during the storm. The high wind caused considerable damage at Bangor also.

Eastport, Maine: the storm began at about midnight of the 11–12th, and continued at intervals until about 6.30 p. m. on the 12th; its greatest force was attained at 1.12 p. m., when a velocity of forty-two miles, south, was recorded. Several vessels in the harbor dragged anchor, and the schooners "Anna Bell" and "Northern Star" broke from their moorings; the "Northern Star" was blown on Pain's Ledge and sank.

V.—The centre of this low area moved from Texas (where it appeared on the morning of the 15th) in a northeasterly direction, reaching the lower lake region on the 16th, and pasing off the New England coast on the afternoon of the 17th. Rain and snow occurred in all districts east of the Rocky mountains on the 15th and 16th, the weather generally clearing in all districts on the 17th. The following maximum wind velocities were reported: Indianola, Texas, forty-nine miles on the 15th; Galveston, Texas, thirty-four miles on the 16th; in the lake region, twenty-five to forty-five miles, except at Rochester, New York, sixty miles, and at Buffalo, New York, seventy-one miles during the night of the 16th. The temperature rose from 5° to 10° in all districts east of the Missouri valley on the 14th; the rise continued in the lower lake region, Tennessee, the Ohio valley, and the districts on the Atlantic coast no the 15th, and in the middle and south Atlantic states on the 16th.

The following notes relating to this storm have been received from Signal Service stations:

Norfolk, Nirginia: at 8.30 a. m. on the 17th the wind attained a velocity of thirty-seven miles from the west, which is the highest velocity recorded here since February, 1881. Buildings were blown down, telegraph lines prostrated, and other damage caused. The Coast Survey steamer "Ready" dragged anchor in this harbor during the storm. No disasters to shipping occurred. The warning given by the signal display was generally heeded.

Fort Myer, Virginia, 16th: the barometer fell steadily all day, declining .51 from 7 a. m. to 11 p. m.; at 10.40 p. m. the wind became high, and at midnight the velocity was estimated at fifty miles per hour.

Baltimore, Maryland: from midnight of the 16–17th to 3 a. m., the wind was fresh from south and southeast; at 3 a. m. it veered to southwest and blew with increased force; at 5 a. m. it was northwest, and at 9.15 a. m. a velocity of thirty-seven miles was recorded. Considerable damage was done in this city. On Chesapeake bay the storm is reported to have been the severest experienced since October, 1878. The steamers "Nio" and "Byrn Glas" collided during the storm, the former sustaining serious damage; the bark "May Queen" was blown from her moorings and slightly damaged.

Toledo, Ohio, 16th: a high wind prevailed from 1.30 to 4 a. m., a velocity of thirty-four miles per hour, occurring at 2 a. m.; from 4 a. m. to 5 p. m., the wind was brisk; at the latter hour it increased, and at 5.35, twenty-six miles, southwest, occurred, followed during the evening by sleet and a blinding snow-storm. The snow drifted so as to cause the delay of trains on all railroads entering this city.

Buffalo, New York: the barometer fell rapidly during the 16th, and until 1 a. m. on the 17th, with fresh to brisk northeast winds; after 1 a. m. the barometer rose rapidly; at 3.35 the wind veered suddenly to southwest, and blew with the force of a gale. The storm continued all day, throughout the 18th, and until 5.40 a. m. on the 19th. A maximum wind velocity of seventy-one miles per hour occurred at 5.25 a. m. on the 17th; considerable damage was done in this city and vicinity. Reports from Niagara Falls state that the storm of the 16–18th was one of the severest that has occurred for many years. The wind blew with hurricane force, prostrating trees and telegraph poles, and unroofing buildings.

Rochester, New York, 17th: at 4.10 a. m. the wind suddenly increased to the force of a gale; a velocity of sixty miles was recorded between 4.20 and 8 a. m. This storm was the severest of the year, and caused much damage in this vicinity. More than four hundred telephone wires and many telegraph poles were prostrated.

Mount Washington, New Hampshire, 17th: the barometer fell rapidly during the day, the lowest reading, 29.24, was observed at 7 p. m. The wind veered from south to west, and increased to hurricane force; at 9.43 p. m. the anemometer cups were blown away when the wind was blowing at the rate of one hundred miles per hour. The hurricane continued during the early morning of the 18th the wind attaining a velocity of one hundred and one miles.

Boston, Massachusetts, 17th: a westerly storm prevailed from 12.15 p. m. until 4 a. m. on the 19th. A wind velocity of forty miles, west, occurred a 4.45 p. m.

Eastport, Maine, 16th: the storm began at 6.12 p. m., and continued until 8.52 a. m. on the 17th, the wind attaining a velocity of forty-eight miles per hour from the northeast at 6.04 a. m. This storm was of unusual severity along the coast, and caused much damage to shipping interests. One steamer and eighteen schooners remained in port during the display of cautionary signals.

VI.—This low area passed from Manitoba to the Gulf of Saint Lawrence between the 19th and 21st. The lowest pressure being represented by the isobar of 29.90 while in Manitoba, the pressure at the centre had decreased to 29.40 when it reached the Saint Lawrence valley. Local snows occurred in the lake region, and in New England on the 20th and 21st. The highest wind velocities occurred after the centre had passed, and the wind had shifted to the northwest. Velocities of thirty-eight miles in the lower lakes, thirty-seven on the New England coast, and forty-nine on the middle Atlantic coast were reported. The warm wave accompanying the fall in pressure reached the lake region on the 19th, and on the 20th, extended to the Atlantic coast, and passed off on the afternoon of the 21st. Velocities from twenty-five to thirty-six miles in the lake region, and from twenty-five to forty miles on the Atlantic coast, were reported.

VII.—This area passed eastward from the Northwest Territories and north of the lake region, between the afternoon of the 21st and the morning of the 23d. It had but a slight effect on the weather conditions in the United States. Local snows occurred in the upper lake region on the 22d and 23d, with a maximum wind velocity of twenty-eight miles, reported from Milwaukee, Wisconsin. The midnight report of the 21st showed a rise in temperature of 20° in the extreme northwest. This warm wave extended as far east as the lower lakes and Tennessee on the 22d, and reached the Atlantic coast on the 23d, and in New England and the middle Atlantic states the temperature continued to rise during the 24th and 25th. This continued rise in temperature during the 24th and 25th was, however, caused by the development of low area viii. on the afternoon of the 23d.

VIII.—The centre of this low area appeared in Colorado on the afternoon of the 23d, completely surrounded by the isobar 29.70. The pressure at the centre decreased from .10 to .15 as it passed to the northeast. At midnight of the 23d rain or snow was reported from all districts east of the Rocky mountains, where it continued on the 24th and still continued in the lake region and on the Atlantic coast on the 25th. The highest wind velocity reported in the lake region was thirty-six miles, at Grand Haven. The effect of this area on the temperature was, as stated in the description of low area vii., a continued rise in the eastern districts during the 24th and 25th.

IX.—This low area appeared north of Lake Huron at midnight of the 25th, accompanied by rain in the lower lake region. It passed during the next day into the Saint Lawrence valley. Local snows occurred on the 26th in New England. Maximum velocities of twenty-five to fifty-three miles occurred in the lake region, and from twenty-five to forty-one miles on the Atlantic coast were reported.

The observer at Buffalo, New York, reports the following: "A southwesterly storm began at 2.45 p. m. of the 26th, and continued all day, the wind reaching a velocity of fifty-three miles per hour at 7.25 p. m.; the storm was accompanied by snow which drifted badly and obstructed railroad travel."

X.—This low area appeared on the afternoon of the 26th; by midnight the centre was near Leavenworth, Kansas, where the barometer read 29.88. The pressure at the centre had fallen to 29.70 when it reached the Ohio valley, and still further decreased to 29.50 on the New England coast, and to 29.00 as it passed over Nova Scotia. Snow in the lake region and the upper Mississippi valley and rain in Tennessee and the Ohio valley fell on the 27th and in the lake region and New England on the 28th. High winds prevailed in the lake region and on the Atlantic coast on the 27th and 28th. Maximum velocities of twenty-nine miles in the lower lake region and from thirty-six to forty-four miles on the middle Atlantic and New England coasts were reported. The temperature rose from 10° to 20° in the Missouri valley and southward to include the west Gulf states on the 26th. On the 27th this warm wave moved into the south Atlantic states and thence up the Atlantic coast.

The observers at Portland and Eastport, Maine, report, as follows:

Portland, Maine, 28th: the storm began at 3.50 a. m. and continued with great severity until 6.15 p. m.; snow fell to a depth of ten inches. Mariners consider this storm to have been the severest experienced for many years. Reports from all along the coast on the 29th stated that the storm was of unusual violence and caused much damage. The schooner "Arcana," from Portland to Bear River, Nova Scotia, went ashore on Quaco Reef at 2 a. m., and the schooner "Australia" was wrecked at the Two Lights, about ten miles from this port.

Eastport, Maine, 28th: the storm set in at about 3 a. m. and continued until the early morning of the 29th; it was most severe between 4 and 5 p. m., a wind-velocity of fifty-two miles per hour from the south, having been recorded at 4.22 p. m. The schooner "Chas. F. Jeffrey" went ashore in Romney bay and lost deck load; several wrecks occurred on the New Brunswick and Nova Scotia coasts. A large number of boats remained in this harbor during the signal display for this storm, which is considered one of the severest experienced on this coast for many years.

The "New York Herald," of January 30, 1885, contained the following:

SAINT JOHNS, N. F., *January* 28, 1885.—The telegraph stations at Rose Blanche and Channel report a fearful northwest blizzard yesterday and last night. The whole codfishing fleet were moored on the ground when the storm occurred. Some twenty-three were driven off and their safety, being all open boats, is despaired of. One skiff sank at the entrance to Rose Blanche and the crew perished. From Petits, Lecou, and neighboring fishing settlements other craft are missing. Some fifty to sixty fishermen are yet unaccounted for. Many of the surviving fishermen were severely frostbitten.

XI.—This low area appeared north of Montana at midnight of the 30th; during the next day it reached the lake region, and at the last report of the month was central in northern Michigan. At this report snow was falling in the upper lake region, and rain in Tennessee. The wind in the upper lake region had shifted to northwesterly, and a maximum velocity of twenty-seven miles was reported from Grand Haven, Michigan.

NORTH ATLANTIC STORMS DURING JANUARY, 1885.

[*Pressure expressed in inches and in millimetres: wind-force by scale of* 0-10.]

The paths of the depressions that have appeared over the north Atlantic ocean during the month are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports obtained through the co-operation of the "New York Herald Weather Service," and from other miscellaneous data received at this office up to January 25th, 1885.

The attention of international co-operating observers is called to the change in the time of recording the simultaneous observation, which is now taken at 7 a. m., seventy-fifth meridian *(eastern)* time, corresponding to noon Greenwich time, or eight minutes earlier than heretofore.

Nine depressions are traced over the north Atlantic ocean within the region covered by the reports. Of this number seven are storms which originated in the United States or Canada, and, reaching the Gulf of Saint Lawrence and the Maritime Provinces, continued to move in a northeasterly direction over the ocean. Number 1 was probably a continuation of the depression traced as number 7 on the chart for December, 1884; the remaining disturbance, number 7, appeared off the New Jersey coast on the 24th, when the storm described as low area viii., under "Areas of low barometer," was central in the lake region.

The weather during January, 1885, over the Atlantic ocean north of the forty-fifth parallel, and also along the coast of the United States, was very stormy, the month being marked by constant and violent gales from ssw. to w. and nw. The winds attained their maximum force, generally, after shifting to w. and nw., and were accompanied by a rapid fall in temperature, especially over the region west of the forty-fifth meridian. From the 18th to the 21st an area of barometric minima apparently existed over the ocean between W. 20° and the Iberian peninsula and northeastward to the Bay of Biscay.

The most violent storms of the month were those which occurred between the 23d and 31st, during which period the barometer ranged from 28.5 (723.9) to 29.5 (749.3) over the region north of 45° N. and from the Banks eastward to the European coasts. During these gales numerous trans-Atlantic steamers sustained damage to boats, deck fittings, &c.

The following are brief descriptions of the depressions charted:

1.—This was probably a continuation of a disturbance that occupied mid-ocean at the close of December, when the minimum pressure was about 29.2 (741.7). On January 1st the s. s. "Wisconsin," Bentley commanding, reported a strong nw. gale from 4 a. m. to 1 p. m., in N. 48°, W. 36°, the lowest barometer observed being 29.14 (740.1), at 4 a. m. The s. s. "Borderer," Jno. Hill commanding, had barometer 29.5 (749.3) at about 11 p. m., in N. 49°, W. 35°, wind blowing a moderate gale from wnw. and w., with heavy rain; and the s. s. "Lake Champlain," M. L. Tranmar commanding, experienced a whole gale which began on December 31st and ended January 1st, the barometric minimum, 29.32 (744.7), occurring at 9 a. m. of the 1st, with wind from nnw. to nw. and wsw. Captain Tranmar reported the winds during the passage as mostly from wsw. to nw., unsteady as to force, and with constant hail, rain, and snow, and very disturbed sea. During the 2d and 3d, the disturbance apparently moved northeastward to the western coasts of the British Isles.

2.—This was a continuation of the depression traced over the American continent as low area ii. At midnight of the 7th, it was central over the northern part of the Gulf of Saint Lawrence with pressure below 29.0 (736.6). On the 8th, the disturbance was central between W. 45° and the Newfoundland coast, the pressure over the Banks ranging from 29.5 (749.3) to 29.8 (756.9), with strong breezes to moderate gales from ssw. to w. The disturbance moved east-northeastward during the 9th and 10th, attended by increasing sw. to nw. gales and generally threatening weather over the region between W. 40° and 20° and from N. 45° to 55°. On the 10th the lowest reported barometer reading was 29.13 (739.9) in N. 55°, W. 15° with strong w. gale, the centre of the depression being probably to the northeastward of that position.

3.—This was probably a continuation of the depression elsewhere described in this REVIEW as low area iii. During the afternoon and night of the 10th it passed over the Gulf of Saint Lawrence and Newfoundland and on the 11th the centre was near N. 47°, W. 47°, where the barometer read 29.4 (746.7). Moderate ssw. and sw. gales occurred between W. 45° and New-

foundland, while strong w. and nw. gales prevailed over the region west of the fifty-fifth meridian. During the day the depression appears to have moved north-northeastward, and on the 12th it was shown to the northward of 55° N. and west of the thirtieth meridian, the lowest readings being about 29.6 (751.8); during the day the disturbance passed beyond the range of the observations. Steep gradients existed over the region to the southwest and south of the area of low barometer, causing strong w. and nw. gales.

4. This depression was a continuation of that charted over the United States and Canada as low area iv. At midnight of the 12th the centre was over the Gulf of Saint Lawrence; it moved slowly in a direction slightly south of east, and on the following morning the centre was near the southern coast of Newfoundland. Severe electrical storms occurred in the southeast quadrant of this depression on the night of the 12th.

Captain Rigby, commanding the s. s. "Wyoming," reported that a gale set in from s. at 8 p. m. of the 12th, veering to sw. at midnight, to w. at 2 a. m. of the 13th, and to nw. at 8 a. m.; the barometer was lowest, 29.81 (757.2), at 4 a. m. of the 13th and had been falling since noon of the preceding day. The gale was at its height (force 10) at 2 a. m. of the 13th, at which force it blew for about an hour, and by 8 a. m. it had fallen to a light breeze. The ship's position at the time the gale was most violent was N. 43°, W. 60°. Between 10.30 p. m. and midnight of the 12th the compasses were very much disturbed, all of them, four in number, jumping around the circle several times both ways. No lightning was observed, but the pilot who was taken aboard reported a lightning display early in the evening in the vicinity of Sable Island.

Captain Kelly, commanding the s. s. "British King," reported that when off George's Banks on the 12th he passed through a most unusual and violent electrical storm which lasted from 6 p. m. to 9 p. m. From 6.45 to 8 p. m. rain fell in torrents and the peals of thunder were deafening; the lightning was a continuous blaze and was so intense and blinding that a lookout was impossible, and the ship was stopped to lessen the danger of collision. The yard-arms and masts were tipped with Saint Elmo's fire.

On the 14th the observations indicated the presence of the disturbance off the eastern coast of Newfoundland, but the disturbance was probably of small diameter as the barometric observations were not below 30.0 (762.0). On the following day, however, the disturbance appears to have increased in area, while the pressure had fallen to 29.5 (749.3); from W. 50° eastward to 30°, and from N. 45° to 52°, strong sw. to nw. gales were reported, the pressure within the above limits ranging from 29.5 (749.3) to 30.1 (764.5). During the 16th and 17th the depression continued to move in a course slightly south of east, attended by moderate to strong gales from se. to nw., and on the 18th it probably became merged in an area of low pressures which occupied the ocean south of 45° N., and between W. 10° and 20°.

5.—This was a continuation of low area v.; it passed off the New England coast and over Nova Scotia during the night of the 17th as a severe storm, the pressure when last observed at land stations, being 28.97 (735.8). On the 18th it was central on the Banks of Newfoundland; several steamers encountered the gales produced by this depression, which were very severe, the most violent gales occurring after the wind had shifted to westward when they were reported as blowing at the rate of seventy to eighty miles an hour. The lowest pressures reported ranged from 29.1 (739.1) to 29.3 (744.2). During the 18th the depression passed rapidly northeastward and on the 19th it was shown near N. 52°, W. 33°, with no material change in pressure and no abatement in the force of the w. and nw. gales which followed in its rear. During the 20th and 21st, there was a decrease in the barometric gradients over the ocean and a corresponding decrease in the force of the winds, although these still continued to blow with a force of 7 to 8. On the 22d, the disturbance was off the southwestern coast of Ireland.

6.—This was a continuation of low area vi., which was central over the western part of the Gulf of Saint Lawrence at midnight of the 21st. On the 22d the centre was near the southeastern coast of Newfoundland, the lowest barometer reported being 28.66 (728.2); heavy nw. gales prevailed along the coast of the United States southward to the thirtieth parallel, with westerly gales from Nova Scotia to the Banks and s. and se. gales to the eastward of W. 50°. During the 23d, 24th, and 25th the disturbance moved northeastward, accompanied by furious gales from s. to w. and nw., the pressure near the centr being less than 28.8 (731.5).

The following vessels reported pressures below 29.0 (736.6): s. s. "Republic," Captain Irving, commander, in N. 45° 35′, W. 50° 0′, barometer 28.66 (728.0) on the 22d, wind from se. to wnw., force varying from 7 to 10; s. s. "Lake Champlain," M. L. Tranmar, commanding, 23d, at 4 a. m., barometer 29.0 (736.6), heavy squalls; so dense was the snow in the squalls that the masthead light was obscured from the bridge; 8 a. m., barometer 28.98 (736.1), strong gale from nw. by w.; same weather at noon; ship's position, N. 45° 33′, W. 41° 38′. During the afternoon the gale continued from wnw. with very high and dangerous sea, barometer rising; midnight, barometer 29.4 (746.7), lightning to the northward, heavy snow squalls. S. S. "State of Georgia," G. Moodie, commanding: "23d, 9 a. m., the barometer, which had risen to 29.3 (744.2), again fell to 28.96 (735.6), wind s. 56 w., force 9, and continued to fall until 9.30 p. m. (12 hours 24 minutes, Greenwich time), when it read 28.87 (729.0) in latitude 48° 25′ N., longitude 43° 27′ W.; from this the rise was very slow and the wind blew with a force of 9–10 for more than thirty-six hours." The s. s. "Rhynland," J. C. Jamison, commanding, in N. 48° 57′, W. 40° 10′, on the 23d had barometer 28.9 (734.0), whole gale from s. to w. and nw. S. S. "Waesland," J. Ueberweg, commanding, in N. 48° 05′, W. 34° 16′, on the 23d had barometer 28.5 (723.9), whole gale from ne. to e., se. and s., and thence to sw. and w. All vessels reported very high westerly sea during these gales. The stormy weather continued until the 25th, when it began to moderate somewhat over the region east of 30° W. On the 26th the depression was off the Irish coast with the pressure, as reported, about 29.6 (751.8).

7.—This depression appeared off the New Jersey coast on the morning of the 24th, when the barometer near the centre read 29.4 (746.7); it moved notheastward along the coast of Nova Scotia, attended by moderate e. gales to the northward and w. gales to the southward and westward of the centre. It continued its northeasterly movement during the 26th, and on the 27th it probably merged in the depression described as 8, which was then central near N. 50°, W. 45°.

8.—This was a continuation of the depression which moved over Canada during the 25th and 26th, and elsewhere described as low area ix. At midnight of the 26th it occupied the mouth of the Saint Lawrence river, whence it moved with decreasing pressure over the northern part of Newfoundland, and on the 27th was shown near N. 50°, W. 45°. Its passage was attended by severe w. gales from the coasts of the United States to the fiftieth meridian. On the 27th, vessels between N. 45° and 50°, and W. 40° and 48°, reported pressure ranging from 28.7 (729.0) to 29.0 (736.6). On the, 28th the atmospheric pressure over the region between N. 48° and 55°, and W. 40° and 25°, ranged from 28.5 (723.9) to 28.88 (733.5) while an increase had set over the region to the westward of the fortieth meridian. Westerly gales of hurricane force, with squalls of hail, snow and sleet, were experienced by all vessels reporting. The sea was very high during these gales; the s. s. "City of Montreal" A. Redford, commanding, reported, on the morning of the 27th, the barometer began to fall and on reaching 28.76 (730.5) the weather became worse and a severe gale set in from sw. which lasted until noon of the 28th, (vessel's position between N. 47° 45′, W. 42° 00′ and N. 48° 48′, W. 34° 00′). Serious damage was done by the heavy seas which reached at least an altitude of forty feet during the gale. During the 29th and 30th, the depression moved northeastward, the barometer and state of the weather remaining unchanged during

those dates. On the 30th the disturbance was off the British coasts.

In connection with this storm, Captain B. Gleadell, commanding the s. s. "Celtic," in about N. 47° 39′, W. 40° 18′, furnishes the following letter:

It commenced on the 27th at 10 a. m., ship's time, with the wind from sse., (true) force 6, light rain, and barometer falling rapidly. 11.30: suddenly shifted to sw., thence gradually veered w. by s., and increased to force 8. Noon: barometer 28.85 (732.8), stopped falling. 1 p. m.: barometer 28.90 (734.0), began to fall again, and wind backed sw. by s., force 9. 3.30 p. m.: barometer 28.79 (731.3), began to rise again, and wind veered w. by s. 10 p. m.: barometer 28.94 (735.1), storm at its height, force 11–12, and continued with unabated fury and gradually rising barometer until the 28th, 6 p. m., when the wind veered to w. without any abatement in force until 2 p. m., when it gradually moderated to a strong gale, afterwards moderating to a strong breeze at midnight, then it veered to nw., and moderated to light breeze. Encountered a very high northerly swell next day, 29th. It may be of interest to note that the speed of ship during the height of the storm, had to be reduced to three knots per hour, and ship's head brought end on to the sea, in order to avoid doing damage; as it was, we had two boats disabled.

9.—This disturbance was a continuation of that charted as low area x., which moved into the Atlantic from the New Jersey coast and thence northeastward to Nova Scotia during the 28th. On the 29th it was near the southern coast of Newfoundland; from that date until the close of the month it moved northeastward, causing a continuance of the severe gales which accompanied number 8. This disturbance closely followed the preceding, the combined system forming an extensive area of low barometer, within which the pressure ranged from 28.4 (721.3) to 29.3 (744.2) over the region from N. 45° northward, and between the forty-fifth meridian and the European coasts, while strong gales from sw. to nw. prevailed as far south as the thirty-fifth parallel.

OCEAN ICE.

On chart i., are exhibited the eastern and southern limits of the region within which icebergs have been observed during January, 1885. These limits are determined from reports furnished by shipmasters, and from data published in the "New York Maritime Register."

During the month icebergs have been reported between W. 45° 30′ and W. 42° 24′. None were observed south of the forty-seventh parallel.

In January, 1885, they were observed about 11 days earlier than in the same month of last year, and were about 4° farther to the eastward than those of January, 1884.

In January, 1883, the first icebergs reported were seen in N. 47° 35′, W. 45° 04′, on the 30th; in 1882 the first icebergs were seen in N. 47° 30′, W. 48° 35′, also on the 30th.

Icebergs were reported in January, 1885, as follows:

January 13th.—S. S. "City of Montreal," in N. 47° 33′, W. 42° 56′, passed an iceberg 600 feet long and 80 feet high; s. s. "Siberian," in N. 47° 27′, W. 43° 24′, passed a large iceberg.

January 31st.—S. S. "Ethiopia," at 5 a. m. passed a large iceberg in N. 48° 43′, W. 42° 24′; from 7 a. m. to noon, in N. 48° 20′, W. 43° 24′, passed five large icebergs; from noon to midnight, in N. 47° 32′, W. 45° 30′, passed six large icebergs.

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York and Philadelphia, and in the Custom House at Boston, where the necessary blanks and other information will be furnished to shipmasters.

The following circular explains the object of these agencies:

UNITED STATES OF AMERICA,
SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, November 29, 1884.

SHIP-MASTERS: It is now generally known that a large percentage of *American storms* travel across the Atlantic and in a few days after leaving our coast affect the *weather conditions of Europe.* Ship-masters' observations prove this, and Captain Henry Toynbee, Marine Superintendent of Great Britain, who has investigated the subject with much vigor, says: "ENE., thirty to forty miles an hour, has been adopted as a rough estimate of the track and speed of storms crossing the Atlantic until they arrive off the west coasts, when they are affected by the disposition of pressure over western Europe."

How important it is, then, for the ship-master about to sail to America from European ports to know the *probable weather conditions* he is likely to have on his westward passage, or where he will be likely to encounter a *storm or hurricane at sea.*

The London Meteorological office will now make an earnest effort to make such predictions, and, in connection therewith, *the United States Signal Service*, at the solicitation of *the Meteorological Council of Great Britain*, has accepted an invitation to lend assistance in this important movement to benefit the *commerce of the whole world*, and will collect meteorological information from ship-masters arriving in New York and Boston and cable the same to the London Meteorological Office. From this point bulletins and warnings will be issued and telegraphed in times of great danger to all *European seaports.*

* * * * * *

I am, very respectfully, your obedient servant,

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l,
Chief Signal Officer, U. S. A.

In pursuance of the arrangements made with the Meteorological Office of London, England, there have been cabled to that office from New York twelve reports of storms encountered by vessels on the Atlantic west of the forty-fifth meridian. Three messages were sent from Boston.

TEMPERATURE OF THE AIR.

[*Expressed in degrees, Fahrenheit.*]

The distribution of mean temperature over the United States and Canada for January, 1885, is exhibited on chart ii. by the dotted isothermal lines; and in the table of miscellaneous data are given the means for the various stations of the Signal Service.

In the following table are given the mean temperatures for the several geographical districts with the normals and departures, as deduced from the Signal Service observations:

Average temperatures for January, 1885.

Districts.	Average for Jan. Signal-Service observations.		Comparison of Jan., 1885, with the average for several years.
	For several years.	For 1885.	
	°	°	°
New England	26.1	26.1	0.0
Middle Atlantic states	33.2	33.8	+ 0.6
South Atlantic states	47.1	47.3	+ 0.2
Florida peninsula	61.5	61.5	0.0
Eastern Gulf states	48.9	45.7	— 3.2
Western Gulf states	47.4	43.5	— 3.9
Rio Grande valley	58.3	51.8	— 6.5
Tennessee	39.7	34.8	— 4.9
Ohio valley	32.2	26.8	— 5.4
Lower lake region	26.1	21.6	— 4.5
Upper lake region	18.7	12.2	— 6.5
Extreme northwest	4.3	— 2.2	— 6.5
Upper Mississippi valley	23.2	16.2	— 7.0
Missouri valley	16.4	9.8	— 6.6
Northern slope	17.6	16.8	— 0.8
Middle slope	25.5	20.8	— 4.7
Southern slope	43.3	38.8	— 4.5
Southern plateau	40.9	39.8	— 1.1
Middle plateau	28.9	30.2	+ 1.3
Northern plateau	29.1	23.8	— 5.3
North Pacific coast region	39.0	39.9	+ 0.9
Middle Pacific coast region	47.1	48.4	+ 1.3
South Pacific coast region	53.1	53.0	— 0.1
Mount Washington, N. H	5.4	0.7	— 4.7
Pike's Peak, Colo	2.4	1.4	— 1.0

On chart iv. the deviations from the normal temperature are graphically exhibited by the dotted lines connecting stations of equal departure. At nearly all stations on the Atlantic coast, in western Montana, and on the Pacific coast except in the Columbia valley, the mean temperature for January, 1885, has been above the normal, but the departures have exceeded 3° at but few stations, viz: Helena, Montana, +4°.9; Roseburg, Oregon, +3°.5; Delaware Breakwater, Delaware, +3°.2; Chincoteague, Virginia, and Kitty Hawk, North Carolina, +3°.1. In the Gulf states and in all of the interior districts with the exception of western Montana, the mean temperature has been below the normal, the departures being greatest in Kansas, Nebraska, the lake region, and in the upper Mississippi, Missouri and Ohio valleys. In these dis-